No. 91-1158

In The

Supreme Court of the United States

October Term, 1991

THE STATE OF MISSISSIPPI, ET AL.,

Petitioners,

v.

THE STATE OF LOUISIANA, ET AL.,

Respondents.

On Writ Of Certiorari To The United States Court Of Appeals For The Fifth Circuit

JOINT APPENDIX
VOLUME II, PAGES 127-177

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Petition For Certiorari Filed On January 16, 1992
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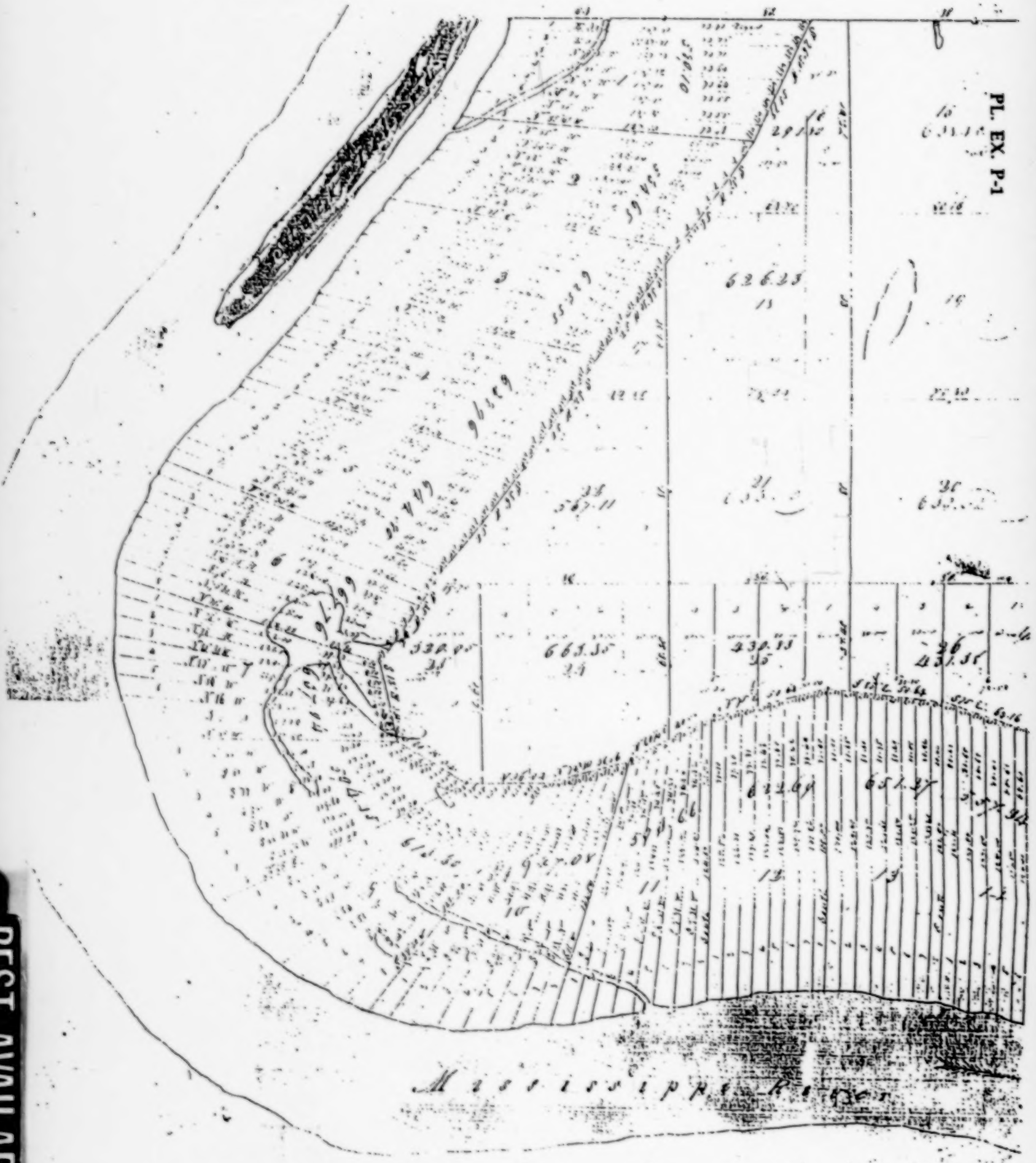
CHOCTAW DISTRICT

T11 R9 W, (Choctaw District)



PL. EX. P-1

Surveyed by [illegible] Deputy Surveyor in 1826 & 27

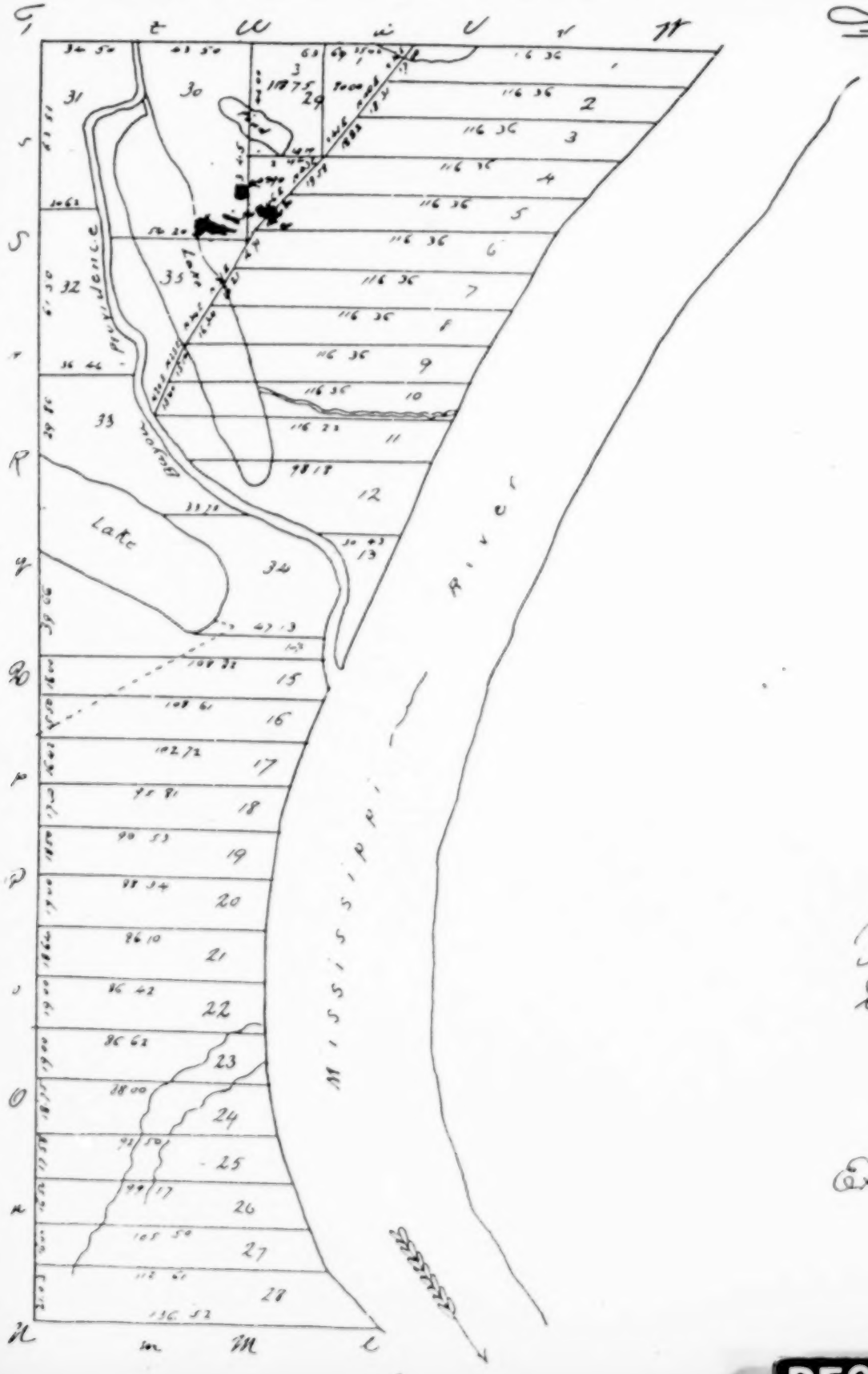
Surveyor's Office Washington

Examined & approved

PL. EX. P-2

T. XXI, R, XIII, E.

District North of Red River Louisiana



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Sect	Area	Sect	Area	Sect	Area
1	160.11	13	67.47	25	159.71
2	161.74	14	181.83	26	170.97
3	163.71	15	174.91	27	174.82
4	165.35	16	165.14	28	263.18
5	159.52	17	164.27	29	244.45
6	168.02	18	159.04	30	378.83
7	163.02	19	160.65	31	161.32
8	158.24	20	165.28	32	167.71
9	160.92	21	162.25	33	217.83
10	165.96	22	163.26	34	178.55
11	173.34	23	164.92	35	121.10
12	193.58	24	169.48		
	1993.51		1898.50		2244.47
					1898.50
					1993.51
			Total area		6136.48

The whole of this Township was Surveyed by Daniel Livermore Deputy Surveyor in the years of 1828 & 1829

Surveyors Office Washington Miss ...
June 30th 1829

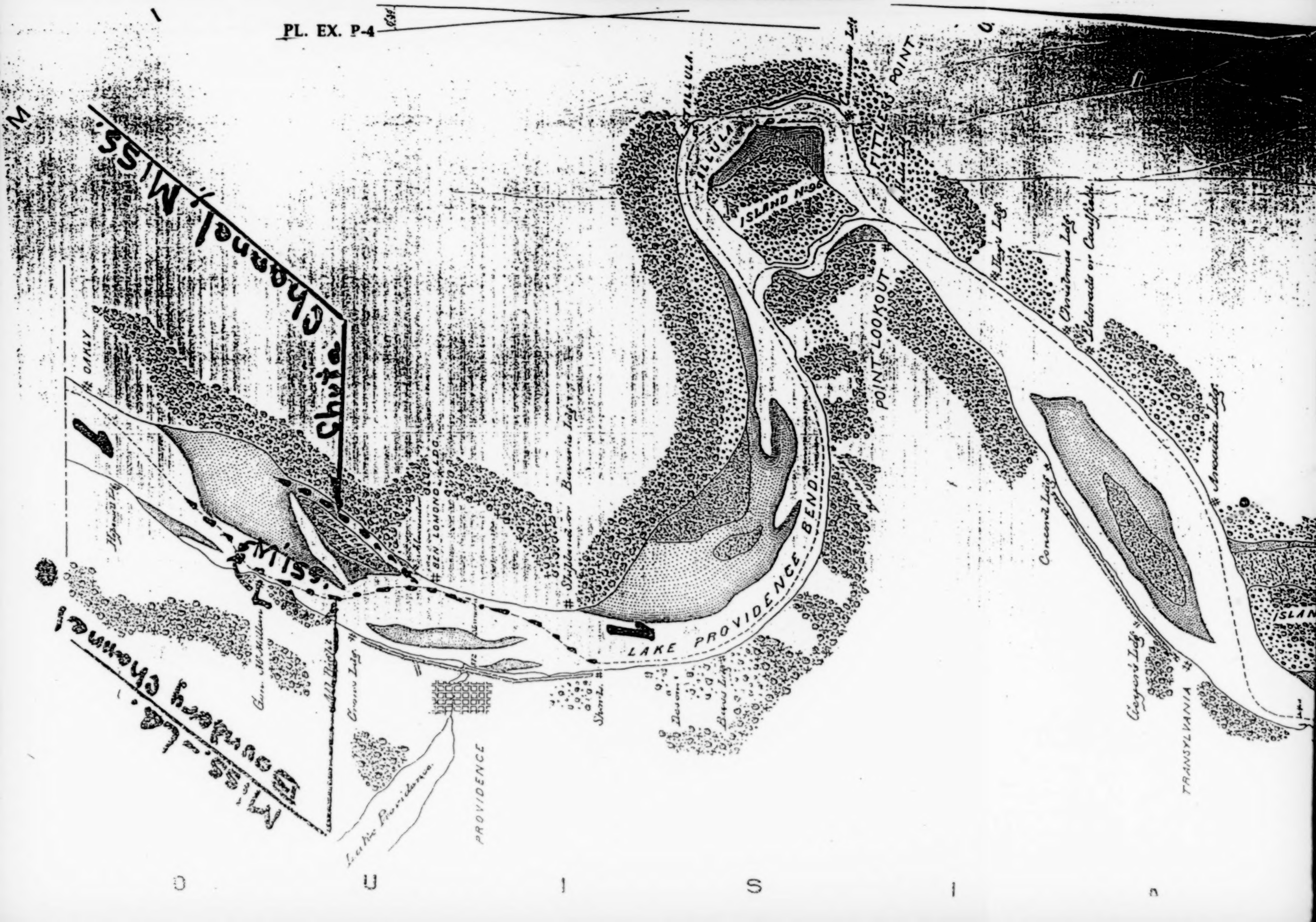
Examined and Approved

Geo. S. Parker
Surveyor of the Public
Lands South of Tennessee

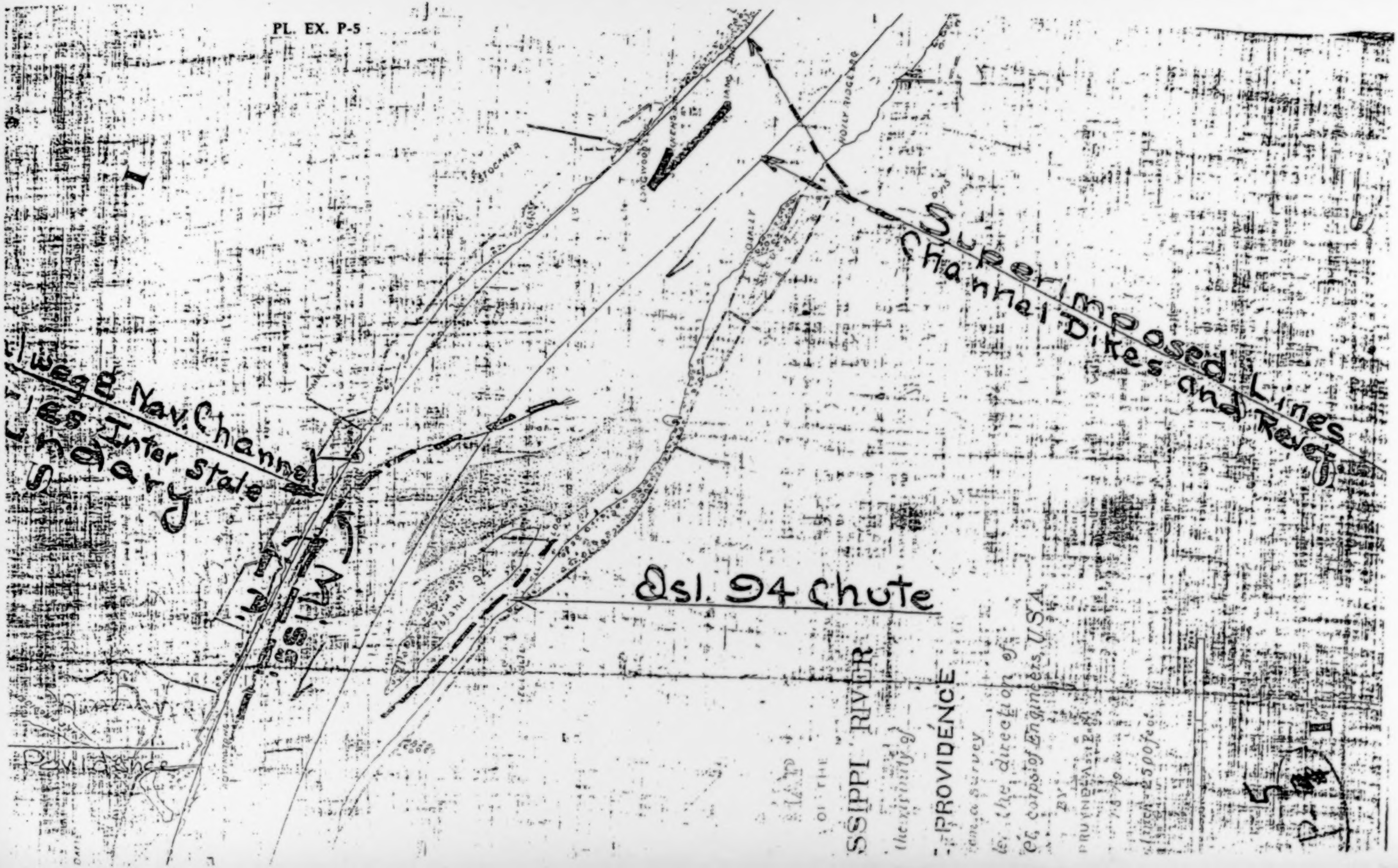
PL. EX. P-3

PLAINTIFF'S EXHIBIT 3

PL. EX. P-4



PL. EX. P-5


Superimposed Lines
Channel Dikes and Revet.
lweg & Nav. Channel
Inter state
Isl. 94 Chute
SSIPPI RIVER
PROVIDENCE
the direction of
Corps of Engineers, USA

132

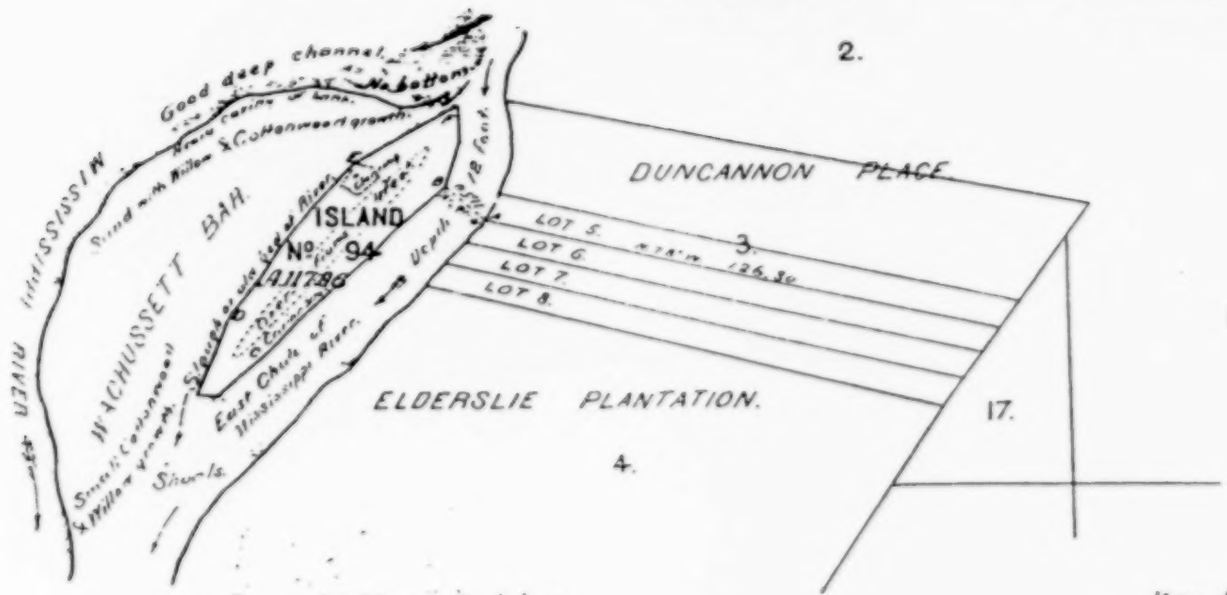
PL. EX. P-7

MISSISSIPPI.
CHOCTAW MER. N & W

Duplicate

PLAT
OF
ISLAND 94,
T. 11 N. R. 9 W.
MISSISSIPPI.

Original plat transmitted to the State authorities and duplicate to the U. S. Register at Jackson Miss'
October 4. 1881.



18.

Mag. Var. 7½ East.

Department of the Interior.
General Land Office.
Oct. 4. 1881.

The above diagram of Island No. 34, in Township No. 11 N. Range No. 3 W., Choctaw Meridian, in the State of Mississippi, is a correct plat of Survey executed by David Strachan, Deputy Surveyor, in pursuance of instructions received from the Commissioner of the General Land Office, bearing date the 12th. day of July, 1881, and is strictly conformable to the field notes of the Survey thereof, which have been examined and approved.

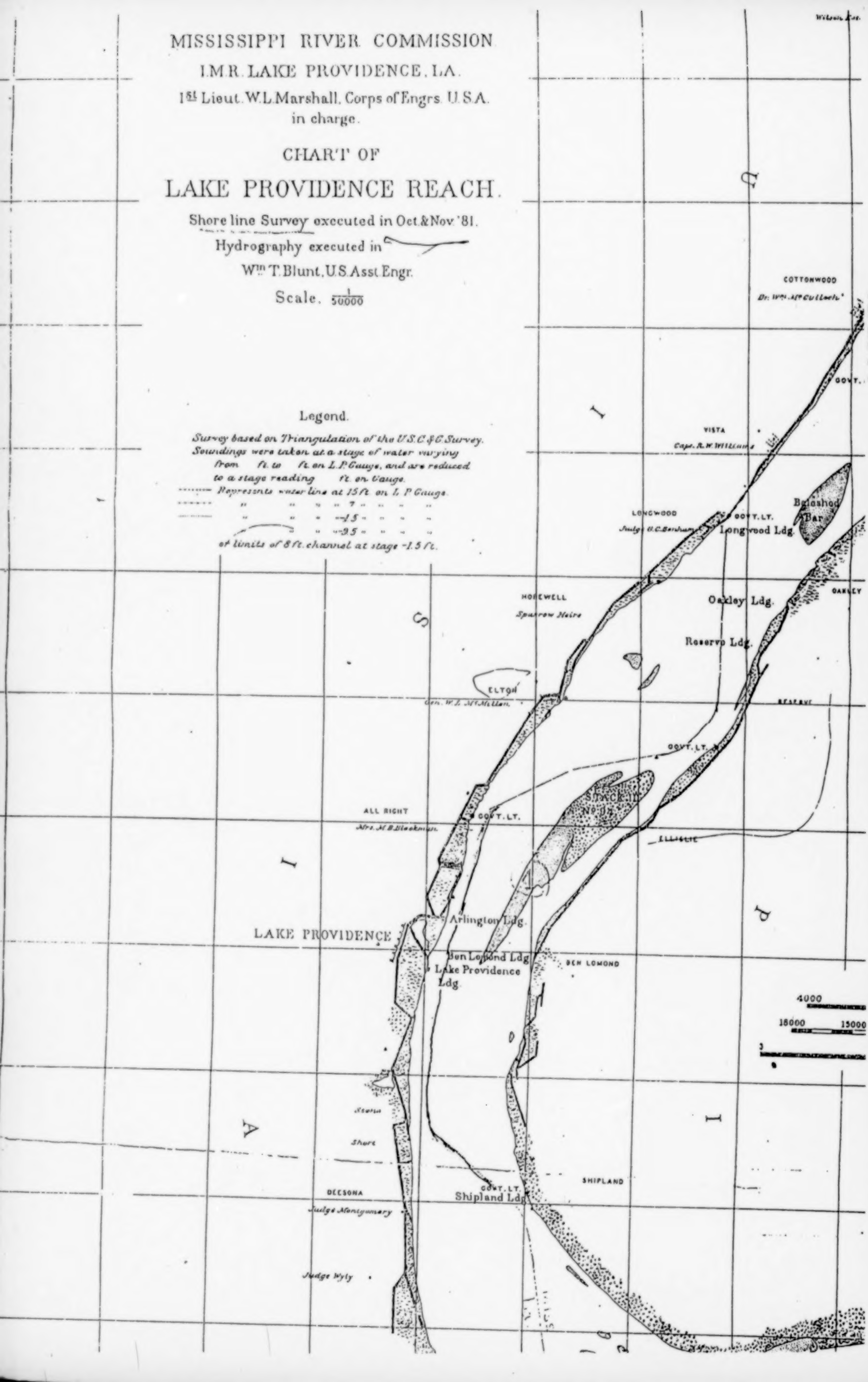
N. C. McFarland

Commissioner and
Ex-Officio Surveyor General

Docketed in tract book Jan 12/1882
MC

POCI

PL. EX. P-8


MISSISSIPPI RIVER COMMISSION
I.M.R. LAKE PROVIDENCE, LA.
1st Lieut. W.L.Marshall, Corps of Engrs. U.S.A.
in charge.
CHART OF
LAKE PROVIDENCE REACH.
Shore line Survey executed in Oct.& Nov. '81.
Hydrography executed in
Wm T. Blunt, U.S. Asst. Engr.
Scale. 1/50000
Legend.
Survey based on Triangulation of the U.S.C.&G. Survey.
Soundings were taken at a stage of water varying
from ft. to ft. on L.P. Gauge, and are reduced
to a stage reading ft. on Gauge.
Represents water line at 15 ft. on L.P. Gauge.
" " " 7 " " "
" " " -15 " " "
" " " -35 " " "
or limits of 8 ft. channel at stage -1.5 ft.
U
I
S
I
A
P
I
COTTONWOOD
Dr. Wm. McCulloch
GOVT.
VISTA
Capt. R.W. Williams
Balashod Bar
LONGWOOD
Judge G.C. Benham
GOVT. LT.
Longwood Ldg.
OAKLEY
Oakley Ldg.
HOPEWELL
Sparrow Heirs
Reserve Ldg.
ELTON
Gen. W.L. McMillan
RESERVE
GOVT. LT.
Stack Id. No. 35
ALL RIGHT
Mrs. M.B. Blackman
GOVT. LT.
ELLISLIE
Arlington Ldg.
LAKE PROVIDENCE
Ben Lomond Ldg.
Lake Providence Ldg.
BEN LOMOND
4000
18000
15000
Scene
Shore
SHIPLAND
GOVT. LT.
Shipland Ldg.
DECSONA
Judge Montgomery
Judge Wyly
Wilson Est.

PL. EX. P-13

Chute Channel

Miss. La.

MRCA-1-4

PLATE NO. 1 EXHIBIT NO. LA-1A

DESCRIPTION: TWO MAPS: (1) LA-1A, (2) LA-1A WITH NOTATIONS. VICINITY MAP COMPOSITE OF USGS QUADRANGLES ON WHICH THE FOLLOWING ARE SUPERIMPOSED: (a) THE 1881 LOCATION OF STACK ISLAND, (b) THE CLAIMED BOUNDARIES BY PETITIONERS AND RESPONDENTS, (c) NOTATIONS BY LOUISIANA.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 1-2

PLATE NO. 2 EXHIBIT NO. LA 16 AND LA 16A

DESCRIPTION: TWO MAPS: (1) LA 16 AND (2) LA 16A. USGS QUADRANGLES, EDITIONS OF 1911 AND 1909, SHOWING THE STATE BOUNDARY AND MAIN NAVIGATION CHANNEL IN THE CHUTE CHANNEL EAST OF STACK ISLAND. WITH NOTATIONS BY LOUISIANA.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 3 & 4

PLATE NO. 3 EXHIBIT NO. LA 18

DESCRIPTION: ONE MAP: LA 18. COMPOSITE MAP OF SHEETS 79, 80 & 81 OF THE 1925-26 MISSISSIPPI RIVER COMMISSION HYDROGRAPHIC SURVEY, WITH LIVE THALWEG OR MAIN NAVIGATION CHANNEL SUPERIMPOSED.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 5

PLATE NO. 4 EXHIBIT NO. LA 18A

DESCRIPTION: TWO MAPS FROM LA 18A, *IN GLOBO*. AN EXCERPT WITH BASE MAP TAKEN FROM THE 1883 REPORT OF THE MISSISSIPPI RIVER COMMISSION. DESCRIBES IN DETAIL THE LOCATION OF THE MAIN NAVIGATION CHANNEL IN 1881 ON PAGES 423, 425, AND THE ATTACHED MAP, AND THE PROJECT TO DIVERT THE RIVER TO THE WEST OF STACK ISLAND. 1881 AND 1883 TRACKS OF NAVIGATION AND NOTATIONS SUPERIMPOSED BY LOUISIANA.

LOUISIANA EXHIBIT LA-18A

[p. 422] REPORT OF THE
MISSISSIPPI RIVER COMMISSION.

These estimates considerably exceed that made for the Board of Engineers which convened at Memphis, September 4, 1882, but have been deduced from careful survey. More than one-half the water that escapes into the Tensas Basin flows through the gaps above Arkansas City, and there is now an effort being made by the State of Louisiana corporations, and private individuals in Arkansas to the effect closure of this line, and a contract for the work has been made by them. If the reduction of the notes can be made in time the results of the survey will be incorporated in this report before finally submitted to Congress.

FINANCIAL STATEMENT.

Amount alloted		$1,000.00
Expended:		
Instruments and outfit	$51.75	
Services.....	386.66	
Subsistence	35.00	
Miscellaneous.....	23.05	
		496.04
Balance available November 1, 1883		503.96

SURVEY OF CHOCTAW BEND BEACH.

At the date of the last annual report of the commission the survey party under Assistant Engineer William T. Blunt was in the field. The survey was begun November 17, 1882, and completed and the party returned to Wilson's Point December 30, 1882.

The survey was restricted to the hydrography proper, the shore line as determined by Assistant Engineer Ockerson the preceding year being accepted, except where caving banks rendered new locations of shore lines necessary.

The survey extended from Cook's Point to Arkansas City, a distance of 28 miles. The survey shows that there was not less than 13 feet of water at a stage corresponding to a gauge reading of zero on the Arkansas City gauge, or that there existed no obstruction to navigation in 1882, low-water season.

A complete project for the improvement of the reach will be submitted with the maps at the earliest practicable moment. For the present there is no especial demand for its improvement, except the revetment of the upper and lower banks of Cook's Point neck, where it is caving and a cut-off imminent. This requires 7 miles of revetment, at a probable cost of $513,000, if carried to the top of the bank, or $210,000 if restricted to a subaqueous mat. The caving is now back to the cypress swamps, and the material is, as usual in slowly-deposited banks, heavy buckshot, very tough and difficult to cave. The banks, however, are wearing quite rapidly, and the configuration of the river points to a cut-off. The neck now is nearly a mile wide, but low, the water flowing across at several

feet below the ordinary high water. At the up-stream side of the neck is Persimmon hollow, leading into Long Lake, which occupies the middle of the neck, and drains out through Cypress Bayou, on the lower side of neck. The danger lies in this low depression, already sufficiently lowered to cause quite a deep channel-way across at high water, obstructed, however, by a thick undergrowth of cypress, willow, and cottonwood, and accumulated drift-wood.

The report of Assistant Engineer Blunt is herewith.

FINANCIAL STATEMENT.

To amount alloted		$4,000.00
Expended:		
For services	$1,587.92	
For subsistence	495.06	
For tools and supplies	531.36	
Miscellaneous	65.52	
		2,679.86
Balance available November 1, 1883		1,320.14

L 1.

REPORT OF ARTHUR HIDER, ASSISTANT ENGINEER, UPON OPERATIONS OF THE LAKE PROVIDENCE CONSTRUCTION PARTY.

WILSON'S POINT, LA., *November 15, 1883.*

SIR: The following report of operations of the Lake Providence construction party from December 1, 1882, to November 1, 1883, is respectfully submitted.

The work undertaken in accordance with your instructions, and that which has so far been executed has had in view the following objects:

[p. 423] The narrowing of the width of the river in places where it was excessive, to bring the regularized channel within the boundaries fixed in accordance with the original project, by the following methods, viz:

First. The closing of the Duncansby and Skipwith chutes by the construction of a system of pile dikes at and near the head of the Duncansby chute. The filling up of the steamboat channel, which was between the upper and the lower towheads, by the construction of a pile dike joining the two bars and the concentration by this means of the water on the right of the towheads, so as to permanently fix the channel next the Louisiana shore and prevent the further caving of the banks in the Skipwith chute.

Second. The closing of the Mayersville chute by a pile dike across the head, and others in the chute further down, and the protection of the channel side of Mayersville Island by the construction of willow mattresses and revetting the front face of the island to prevent further caving, so as to retain the channel of the river in its present location.

Third. The closing and silting up of the chute between the Baleshed Bar and the Mississippi shore and the prolongation of the Baleshed Bar at its upper and

lower extremities by a system of dikes placed longitudinally and normal to the direction of the current, for the purpose of restricting the width of the river along the Vista and Longwood fronts within such limits as would afford a good channel at all stages and prevent the river passing to the Mississippi side into the Baleshed Chute.

Fourth. The closing of the main channel of the river, which passed between the foot of Baleshed Bar and the head of Stack Island, and bringing it back to the right of Stack Island by a system of deflecting dikes located on the Louisiana side at Elton Bar, and a longitudinal dike, driven across the channel between the lower end of Baleshed Bar and the head of Stack Island, so as to prevent further caving on the Mississippi shore behind the island, which had already done a great deal of damage and was increasing at an alarming rate.

The objects sought to be obtained at all these points have, to a great extent, already been accomplished, as shown by comparative soundings and surveys furnished by the survey party, which accompany this report.

The lack of stone to properly secure the revetment work done in November and December of last year along the face of Mayersville Island, was the cause of the caving of the bank in rear of the mattress work. This would, no doubt, have been prevented had material been available to properly secure the work.

DESCRIPTION AND EFFECTS OF WORK DONE.

Duncansby chute. – During last season a system of low-water dikes was constructed at the head of this

chute, the two upper dikes and the main dike at the head consisting of two rows of piling, securely braced. These dikes were provided with light brush footmats, loaded with stone, laid between the piling, and had screens or open hurdle work placed in front of them.

The three lower dikes across the chute consisted of single rows of piles with screens or open hurdle work in front.

All these dikes did good service and caused a heavy deposit in the chute during the high water; in many places the fill extended to the top of the piles.

The main dikes A and B built last season, connecting the upper and lower towheads, accomplished the result desired, viz, the filling up of the steamboat channel, before existing between the upper and lower towheads; the fill here also extended nearly to the top of the piles. The two bars are now one, and even at high water there is no channel between them.

There has been a general enlargement of the bars in front of Duncansby, and a shoaling of the chute along its whole length. At low water this season a skiff would not float between Duncansby and Skipwith Landing, and at the head of the chute the bar was entirely above water, no water at all entering the chute at the upper end. Skipwith Landing was moved down nearly a mile nearer the mouth of the chute on account of shallow water, to enable steamboats to deliver freight.

On account of the rapid caving which took place during the high water in the bend above Pilcher's Point, deflecting the main current across the river immediately

above and against the dikes at the head of the chute, seriously threatening the work heretofore put in, and together with the rapid caving back of the upper Duncansby towhead, which had been left unprotected; in accordance with your direction, four additional dikes, Nos. 5, 6, 7, and 8, were driven during the high-water stages across the chute, extending as close to the shore as the depth of the water would permit; dike No. 6 consisting of three rows of piles, with a woven mattress 130 feet in width, made in sections of from 100 to 200 feet, overlapping each other, sunk in rear of the dike.

The two lower dikes, Nos. 7 and 8, were provided with thick grillage mats between the piling. These dikes, where the water was shallow, consisted of two rows of piling [p. 424] securely braced, and where the water was of greater depth than 15 feet of three rows. In addition to these precautions a protection dike with a woven mat 100 feet in width, with a screen hung in rear, was driven immediately in front of the caving towhead, and afterwards a mattress placed across the head, lapping around the towhead, was constructed. On the inside the mattress was badly broken up in sinking on account of the bluff bank. This work failed to hold the towhead and has been swept away. The whole force of the river at high water was against the head of the towhead, which is of sand. The dikes put in withstood the high water and show a fill behind them. Gaps were washed out in the low-water cross-dikes constructed last season where they joined the main dike, and also in those further down in the chute; part of this main dike was also scoured out, the channel at low water being in close proximity to the remaining

part. The piles were removed so as to leave as wide a channel as possible.

The effects of this system of dikes is shown in plate herewith, in which the surveys of February, 1882, and October, 1883, are compared; the bar lines are shown at low-water stage, viz, 1'.5 on Lake Providence gauge. For location of dikes, &c., see accompanying map.

Mayersville Island and Chute. – During last season a woven mattress from 100 to 130 feet in width was constructed along the face of the island, beginning at the head and extending down 7,500 feet. The bank was graded by the hydraulic graders, and the upper 1,550 feet revetted on the channel side, the revetment lapping around the head and extending down the chute side about 350 feet. The revetment was constructed by placing a layer of brush along the slope, which was held in position by stakes driven in the bank, to which stringers or binders holding the brush together were securely fastened with wire.

Behind the greater part of the mattress the slope had no protection at all, as it was impossible to get brush and stone in sufficient quantities to finish this work before the high water.

The effect of the high water on the face of this island, which had before been caving rapidly, was, except for about 1,800 feet at the head where the revetment had been partially covered with stone, or held down by sacks of sand, to cave the bank behind the mattresses. The caving has extended from 50 feet at the upper end, to 500 feet at the lower end, back of where the original mattress was sunk, and has rendered necessary the construction of

a new mattress along nearly the entire length of the face of the island, which is now in progress. The cause of the caving back of the island was undoubtedly from the fact of not having sufficient brush to complete the revetment, and stone to hold the bank protection in place, as the island itself is composed nearly altogether of sand.

Had it been possible to have finished the revetment and covered it with stone behind the mattress work as it progressed, it is believed that further caving back of the island would have been prevented. The low-water dike built across the head of Mayersville chute has remained intact, not a break having occurred. The dike here shows good results by the shoaling of the water behind it and the enlargement of the bar at the mouth of the chute, and the increase in size of the towhead near the head of the island.

Further down, the chute has deepened at some places, and in order to prevent further scouring, in accordance with your instructions, dike No. 1, consisting of five rows of piling securely braced, was driven across the chute opposite Mayersville Landing to aid the main dike at the head in filling up the chute. Dikes 2, 3, 4, and 5, built the previous season in the chute, were only partially completed; no particular effect has been observed from the action of these dikes; they are located too far down to aid much in filling up the chute. A sketch showing the condition of the works, November 1, 1883, in this locality is shown in map herewith.

Baleshed Bar and Chute. – The work at this point has been the construction of a main dike extending from the Mississippi shore below the front of Mayersville down

the river 15,000 feet, reinforced by a system of cross-dikes between the main dike and the shore. Dikes 1, 2, 3, 4, and 5 at the upper end, extending to the Mississippi shore, the parts of dikes 4 and 5 nearest the bank, as well as part of 10 and 11 and the whole of 12 were constructed as low-water dikes, part of the main dike between cross-dikes 1 and 4 is also a low-water dike. These dikes were built previous to December 1, 1882, and stood during the last high water with little damage. They are shown on the sketch by dotted lines. The cross-dikes from 1 to 7 have thick grillage foot-mats constructed between the rows of piling, held in place by rock, or the mats fastened to the piling by stringers spiked to them and weighted, and held in place temporarily with bags filled with sand, until a supply of rock can be obtained, and the river is at a high enough stage to allow the stone to be floated on barges to the dikes. The pile-driving done this season at this locality was during the high water, and these dikes may be considered as high-water dikes. The upper part of the main dike has been wattled from cross-dike No. 1 to the Mississippi shore along the middle row of piling up to the 20-foot stage; also dike 1. This work is being continued down from the head of the system, as rapidly as possible. A woven mattress from 40 to 100 feet in width has been constructed in [p. 425] front of the main dike from No. 4 cross-dike to No. 11, to prevent scour. The dike when not provided with a woven mattress in front will have a thick grillage foot-mat constructed between the rows of piling, which is now being done. This will complete the work as laid out at this locality in accordance with your instructions. The general effect of the work here has been –

1st. The enlargement of the Baleshed Bar, both in size and height, and the lengthening of the bar by accretions, both at its head and at the foot.

2d. The filling up of the Baleshed Chute at its upper end, and the enlargement and deepening of the channel along the Vista and Longwood fronts.

3d. The prevention of the threatened crossing of the river between the foot of Mayersville Island and the head of the Baleshed Bar, behind the bar, and down the Mississippi shore.

4th. The filling up of the old crossing between the foot of the bar and the head of Stack Island. For location, &c., of this work see accompanying map.

Stack Island. – In order to force the main channel of the river, which flowed down the Stack Island chute, on the outside and along the face of the island between it and the Elton Bar, a main dike consisting of two rows of piles was driven from a point below the foot of Baleshed Bar to the head of Stack Island, leaving the low-water channel from Longwood through the Stack Island chute open for the passage of boats. This dike was driven as a low-water dike; a grillage foot-mat was constructed between the piles, beginning at the head, as far down as could be put in before the high water covered the dike. During high water this work showed good results, forcing the main channel of the river to the right of the island and building a bar to the head of Stack Island, as shown by the high-water survey of April, 1883. As the river fell to low-water stage the difference of slope on the chute side and the main river was so great, caused by the system of dikes at the upper end of Baleshed preventing

the water from freely entering the upper end of the chute, as to render the current extremely rapid through this dike, resulting in cutting off the top of the bar in front of the dike, and finally carrying away part of the dike near the head of Stack Island. This was replaced and again broken by a sunken barge lodging against it. The break has again been repaired and a grillage foot-mat sunk between the rows of piling. The current passing across the head of Stack Island will be materially lessened as the river rises, and the slope on both sides of the island is more nearly equalized. A channel across the head of Stack Island is not anticipated, as at high water the works on Baleshed Bar above, will be sufficient to cause the bar to again form at a greater height than before, and it is believed entirely stop any water passing into the chute at this point at next low water. For location of dike-work see map herewith.

Elton Bar. – The work here consisted in the construction of a main dike and six short cross dikes, at the head of Elton Bar and in the chute, to act in deflecting the channel across the river toward the head of Stack Island, auxiliary to the Stack Island main dike, and to close the chute, which was rapidly enlarging, along the Louisiana shore and caving the banks at a very rapid rate, and thus concentrate the water in one channel; as when the works were put in it was difficult to determine which of these channels the river would take, behind Stack Island, along the Louisiana shore, or whether it could be concentrated between Stack Island and the then large Elton Bar. Parts of these dikes were carried away by drift during the high water, but not before they had accomplished the desired result. For location of these dikes see map herewith.

METHODS OF CONSTRUCTION.

Dike work. – No material change has been made in the methods employed in the construction of pile dikes from those of last season. The principal change has been in making the dikes of a greater number of rows of piles. The distance between the rows has been increased from 10 to 15 feet in deep water to allow of more secure bracing as well as the thickness and width of the brush work laid at the foot of the dikes to protect them from the actions of the current and prevent scour. The experience of last season's work showed conclusively that the strongest form of construction is required in order to withstand the force of the current at high water, and has led to putting in work of greater strength where exposed to the action of drift.

Pile driving and bracing. – The plan pursued in building pile dikes has been to drive the front and rear rows of piles simultaneously when it could be done, fasten the longitudinal stringers to the piles, and complete the dike by putting in place the cross-braces. In all cases the longitudinal and cross-braces, in addition to being fastened to the piling with spikes, have been well wired with No. 8 wire passed around the pile and across the brace diagonally from the upper to the lower edge, and made taut by twisting. This was rendered necessary on account of the material used for both piles and [p. 426] braces, which is almost entirely cottonwood; but few cypress piles have been used. The piles have been sunk as deep as possible, generally from 15 to 20 feet, depending upon the nature of the bottom. Two forms of bracing have been used, as shown in the sketches, one with rods, for dikes constructed at high-water stage, and the other for

dikes built during low water. These are the same methods used, in accordance with your directions for last season's work, and have answered the purpose well; experience has suggested no improvement upon them. The piles have been sunk by the use of a jet of water forced through a 1 ½-inch gas pipe, leading down the side of the pile, and by the aid of quick blows from a hammer of 2,000 pounds falling through a distance of about 6 feet.

Two forms of pile-drivers have been in operation, one with the leads placed in front of the boat, and the other with the leads on the side. The first form is preferred for general use, especially for cross-dikes and in rapid currents, as being found more convenient to keep in position and handle, and for this reason accomplishing more work. One of the side-lead drivers has been in operation, and has done fair service. These drivers are provided with large boiler capacity and pumps capable of discharging more water under a greater pressure. Piles can be sunk deeper with these than with the others, but the difficulty of handling them in cross-currents reduces their efficiency.

Between 15 and 20 feet has been the average depth of penetration obtained; after reaching that depth, if further sinking is not stopped by gravel, buckshot, or other hard material, the frictional resistance exerted by the sand along the side of the pile generally prevents further penetration. This resistance could not be overcome either by the use of the water-jet or the hammer, or both combined, as the wood of which the piles are composed will not withstand, without splitting, the shock of the hammer falling from a great height. The usual method has been to sink the piles with their large ends down; the butts are

cut off square, and are about 18 inches in diameter, the small ends not less than 10 inches diameter, and the length of the piles from 35 to 50 feet; about ten piles is counted as an average day's work for one driver with a crew of seven men, consisting of a foreman, engineer, and five laborers. No special improvement in the methods followed in pile sinking or in the construction of drivers has suggested itself. They are well adapted for the purposes for which they were designed. Four different kinds of hoisting engines are in use, each of which has an advantage in some particulars over the others; on the whole the small horizontal engines have given the best results, being quicker in operation, and, next to the ordinary crab in use on four of the drivers, costing less for repairs on account of breakage.

Brush mats, hurdles, &c. – The principal dikes have been protected at their foot to prevent scouring out, by constructing mats formed of two, three, or four layers of brush, depending upon the importance of the dike, rapidity of current, depth of water, and danger of cutting out. These layers of brush are placed alternately crosswise and parallel with the dike. Stringers, or waling-pieces, as binders, are first hung from the piles as a framework for the brush to be laid upon. When the mat is of sufficient thickness other binders are laid on top of the mat connected with those underneath by wires at suitable intervals, leading up from the under stringer pieces, twisted together so as to make the construction as close as practicable. The brush is laid so as to extend through the rows of piles, requiring on some of the dikes three lengths of brush, the brush ends overlapping the butts. When finished, the mat extends both in front and rear of the dike

from 10 to 15 feet outside the dike. The grillage mats thus constructed are then sunk in place by being loaded with rock taken to the dike on barges. When woven mats are placed in front of dikes to prevent longitudinal scour they have been built similar in construction to the large mattresses used for the protection of caving banks, and sunk in place by being loaded with rock. For the purpose of preventing the threatened deepening of the Duncansby chute during high water, a brush foot-mat 130 feet in width, made in sections of from 100 to 200 feet in length, was woven on a mattress barge in rear of dike 6, which extends across the chute near the head. Alternate sections were built and sunk. The intervening ones were then constructed so that when in position on the bottom they overlapped the sections previously built about 10 feet, thus forming a continuous brush foot-mat 130 feet wide immediately in rear of dike. The dike itself was constructed of three rows of piles securely braced. In order to insure the mats, when sunk, being close to the dike a strong stringer was spiked and wired across the ends of the weaving poles, which were allowed to extend through the dike beyond the rear piles, thus forming a crib around each pile. Before sinking, the mats were covered with stone, evenly distributed, the upper side of the mat being lowered to its place by the aid of lines fastened to the front row of piles, which were slacked as the mat went down, so as to keep it in a horizontal position. The only curtain construction used this season was that placed in rear of the protection dike built in front of the upper Duncansby towhead. This was of the usual form of woven work, built so as to allow of about one-foot spaces between the brush. It [p. 427] was sunk

by fastening sacks of rock to the curtain, to counteract the force of the current and hold it in position.

The wattling or hurdling has been made close by forcing the pieces of brush down so as to be in contact with each other, and has been done on either the middle or front row when the brush mats are built between the rows of piling so as to provide against the effect of the overfall cutting out the sand in rear of the dikes. Sketches giving details of the different forms of construction employed in the dikes built and their location is shown on map herewith.

The following statements furnished by Assistant Engineer C. P. Ruple, gives in detail, in tabulated form, the work done in dike construction; also an estimated cost for labor for the different classes of work, and amount of material required. All the pile-driving done has been under his charge, and since June 1, 1882, at which time the foot-mat party under Assistant Engineer E. D. Thompson was consolidated with the pile-driving force, this class of work also.

Statement showing dike work from December 1, 1882, to November 1, 1883.

Location.	Dike.	Feet driven since December 1, 1882, standing November 1, 1883.	Washed out and replaced during construction.
Duncansby ..	Duncansby Bar protection.	.....	340
Do	Main dike A	.....	250
Do	No. 1	100	.....
Do	No. 3	150	.....
Do	No. 5	545	.....
Do	No. 6	2,105	275
Do	No. 7	2,061	.....
Do	No. 8	2,310	.....
Mayersville..	Main dike ...	2,300*	.....
Do	No. 1	805	.....
Baleshed	Main dike above 1	1,901	.....
Do	Main dike from 3 to 7..	2,837	1,021
Do	Main dike from 7 to 11	6,903	.....
Do	No. 1	933	.....
Do	No. 2	1,192	.....
Do	No. 3	1,172	.....
Do	No. 4 of 1883	661	469
Do	No. 5 of 1883	983	153
Do	No. 6	1,452	150
Do	No. 7	1,204	500
Do	No. 8	1,011	150

Do	No. 9	1,097	.....
Do	No. 10	924	.....
Do	No. 11	894	.....
Do	No. 12	583	.....
Stack Island	Main dike	5,250	1,429
Elton	Main dike	943	857
Do	No. 1	746	54
Do	No. 2	887	63
Do	No. 3	975	.....
Do	No. 4	300	356
Do	No. 5	484	40
Do	No. 6	435	.....
Totals	.....	44,235	6,432

* Three hundred feet of this dike is incompleted.

Of the above dike there is in –

Single row	2,336
Double row	25,187
Three rows	14,150
Four rows	565
Five rows	1,997
Total	44,235

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 6-7

PLATE NO. 5 EXHIBIT NO. LA-19

DESCRIPTION: ONE MAP: LA-19. COMPOSITE OF SHEETS 66 AND 69 OF 1930 LOW WATER SURVEY BY MISSISSIPPI RIVER COMMISSION SHOWING CONFLUENCE BAR ACCRETION BELOW STACK ISLAND. MAIN NAVIGATION CHANNEL SUPERIMPOSED WITH NOTATIONS BY LOUISIANA.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 8

EXHIBIT NO. LA 32G

DESCRIPTION: GEOLOGICAL INVESTIGATION OF THE ALLUVIAL VALLEY OF THE LOWER MISSISSIPPI RIVER

WAR DEPARTMENT
CORPS OF ENGINEERS,
U.S. ARMY
BY HAROLD N. FISK, PH. D.
ASSOC. PROFESSOR GEOLOGY
LOUISIANA STATE
UNIVERSITY

WAR DEPARTMENT
CORPS OF ENGINEERS, U. S. ARMY

GEOLOGICAL INVESTIGATION

OF THE

ALLUVIAL VALLEY OF THE
LOWER MISSISSIPPI RIVER

CONDUCTED FOR THE

MISSISSIPPI RIVER COMMISSION

VICKSBURG, MISS.

By

HAROLD N. FISK, Ph. D.
Assoc. Professor of Geology
LOUISIANA STATE UNIVERSITY
Consultant

LA-32G

* * *

[p. 51] 1, 7, plate 24). Fine-grained silty and clayey sediments offer a greater resistance to bank recession than do sandy sediments because of their lower permeability, greater cohesion, and their more compact nature. These properties permit a steeper subaqueous profile of equilibrium to be maintained than do those of sandy sediments.

(See plate 24, diagrams 2, 3, and 4 for a contrast between two subaqueous profiles developed in sandy bed and bank materials and one developed in silty sediments in the same area of bank recession on the east bank of the river below Mayersville, Miss.)

Bank recession by slumping causes the subsidence and bankward tilting of bank sediments in blocks or large masses. Slumping is the adjustment caused by the removal of sandy sediments from beneath the more cohesive topstratum (see diagrams 5, 6, plate 24). Cracks caused by incipient slumping, in the areas of relatively thin topstratum landward of the active caving bank, may show a small amount of displacement before slumping takes place. The size of the slump block varies directly with the thickness of the topstratum, and cracks are not present far from the active slump plane in areas of thick topstratum.

Bank recession takes place by continuous sloughing of sands in areas where there is little strength to the topstratum and where sand comes close to the surface, as in river bars. Small blocks may slump into the river; but, after slippage of the mass takes place, these blocks quickly disappear and the shores become generally smooth or broadly arcuate (plate 24, diagrams 6 and 7).

Most of the actively caving banks of the river stand nearly vertical above the mean low-water line. The vertical attitude is maintained by slow attrition as lateral corrosion by the river undermines the bank at the water's edge and permits thin segments of the bank face above water level to fall into the river. This process of undermining is termed "sapping" and appears to be a relatively

unimportant means of banks recession (see plate 24, diagram 7).

Bed Materials and the Shape and Migration of Bends. A meander of a stream flowing in uniform bed materials exhibits a smooth and regular outline and migrates downstream in an orderly manner. In the Mississippi meander belt, however, most migrating bends encounter local resistant bank sediments which slow the rate of bank recession and change the downstream alinement of the river and the directive of stream attack. Irregularities in migration often result in the formation of a disturbed or abnormal meander and eventually lead to the cut-off of the meander loop. The control which is exerted by clay plugs on bend migration and the shaping of bends is illustrated by the development of the meander loops in the vicinity of Lake Lee. Irregularities in channel migration in this area led to the formation of the American Cut-off in 1858 (figure 57).

Reaches. Reaches occur along the Mississippi channel in many places where a relatively constant alinement of the river has been maintained. They are found downstream from some of the points where the river impinges against the valley wall. They also occur in floodplain areas below cut-offs and in places where the alinement is controlled by resistant sediments. River history points to the development of some reaches through a succession of cut-offs in a local area where meander loops are developed on both sides of the axis of a meander belt. As successive cut-offs occur, the river position becomes established between infacing cut-off meanders whose arms have been filled with clay plugs. River alinement is controlled by these relatively resistant channel fillings,

and as cut-offs continue, channel migration become localized to a zone of decreasing width. A reach is formed when the zone of migration becomes so narrow that meander loops can no longer develop. Lake Providence Reach (figure 58) is considered to have formed in this manner. The effectiveness with which clay plugs confine the zone of river migration and prevent the development of meander bends is determined by the spacing, thickness, and toughness of the old channel fillings bordering the reach.

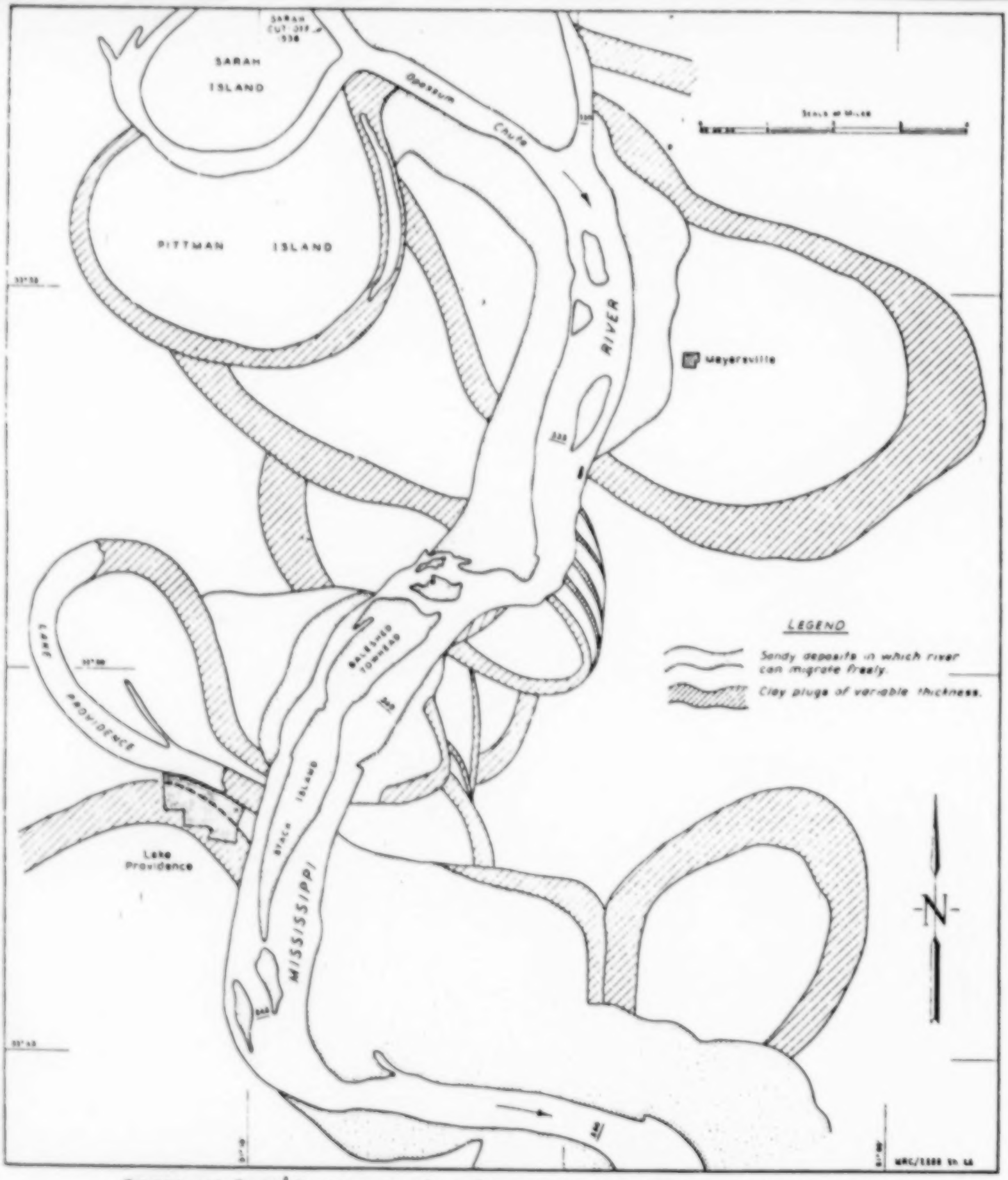
Load. The load of the river varies with stage, slope, and distribution of velocities within the water mass, and with the nature of the bed materials. The principal load of the river, suspended load, has little direct effect upon river activity inasmuch as most of it is in continuous transit to the Gulf. Coarse load is transported mainly as bed load and has a direct effect upon channel cross-section. The stream may become locally overloaded in areas where a large supply of sand is available and it may become "starved" where banks are made up of resistant materials.

There are no measurements to show the quantity of coarse-grained sediments introduced by the tributaries of the Mississippi River. There is, however, no evidence in the nature and distribution of floodplain sediments near the mouths of tributary streams to prove that sands are being introduced by the streams in quantities sufficient to cause local channel aggradation.

The change from a shallow-channel braided stream to a deep-channel meandering stream made it possible for the Mississippi River to scour deeply into coarse

alluvium laid down during early epochs in valley history. These coarse sediments, scoured from the channel or derived from bank caving associated with bend migration, form most of the sand load of the river and are carried but short distances from areas of high-water velocity to areas of low-water velocity where they form bar deposits. The downstream movement of coarse sediments is therefore a slow and discontinuous process termed "trading." The local transfer of sands from caving bank to an adjacent downstream bar halts when the bar is isolated from the river by channel migration or cut-off. The speed of the trading process is dependent upon the speed of channel migration which increases with rise in river stage throughout the valley but decreases downstream as banks become less sandy and the valley slope gentler. Gulfward movement of the coarse sediment is extremely slow, owing to the local and intermittent nature of transfer by trading. Sands are "stored" in bars of the meander belt until subsequent migration of the channel permits reworking of the deposits.

* * *



CONTROL OF RIVER ALIGNMENT BY CLAY PLUGS IN THE LAKE PROVIDENCE REACH OF THE MISSISSIPPI RIVER.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 9

TABLE NO. 1 EXHIBIT 32F

DESCRIPTION: TABLE OF GEOGRAPHIC COORDINATES OF THALWEG AS OF JANUARY 1988 SURVEY.

STATE'S EXHIBIT LA32F

STACK ISLAND – VICINITY OF
LAKE PROVIDENCE, LA.

GEOGRAPHIC COORDINATES OF THALWEG
JANUARY 1988 SURVEY

Pt. 1	(mile 494AHP)	32° 52' 24."16	91° 05' 10."14
2		32° 52' 06."91	91° 05' 32."40
3		32° 51' 56."24	91° 05' 48."35
4		32° 51' 41."32	91° 06' 11."65
5		32° 51' 26."69	91° 06' 34."95
6		32° 50' 40."88	91° 07' 48."12
7		32° 50' 29."06	91° 08' 04."08
8		32° 50' 16."94	91° 08' 19."03
9		32° 50' 02."42	91° 08' 32."62
10		32° 49' 45."74	91° 08' 43."33
11		32° 49' 25."13	91° 08' 54."02
12		32° 49' 12."36	91° 08' 58."25
13		32° 47' 27."83	91° 09' 28."60
14		32° 47' 04."65	91° 09' 32."22
15		32° 46' 36."63	91° 09' 33."47
16		32° 46' 05."54	91° 09' 32."04
17		32° 45' 40."72	91° 09' 28."66
18		32° 45' 02."57	91° 09' 20."04
19		32° 44' 37."86	91° 09' 10."00
20		32° 44' 12."36	91° 08' 50."10
21		32° 44' 03."16	91° 08' 30."99
22		32° 43' 57."13	91° 08' 05."48

STATE'S EXHIBIT
LA 32 F1

STACK ISLAND – GEOGRAPHIC COORDINATES
1882 FIXED THALWEG

Thalweg fixed in 1882 by U.S. Engineers in closing off Main Navigation Channel through Stack Island Chute by constructing Pile Dikes across channel

Pt A	32° 51' 09."06	91° 07' 03."03
B	32° 49' 35."34	91° 07' 39."01
C	32° 49' 23."38	91° 07' 44."47
D	32° 49' 12."81	91° 07' 51."07
E	32° 48' 40."09	91° 08' 30."81
F	32° 48' 32."28	91° 08' 40."89
G	32° 48' 20."52	91° 08' 52."19
H	32° 47' 41."28	91° 09' 24."40

LAKE PROVIDENCE QUADRANGLE
LOUISIANA - MISSISSIPPI
7.5 MINUTE SERIES (TOPOGRAPHIC)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Stack Island Cutoff

Channel Line 1988

Channel Line 1882

Mississippi River

Mike Murray

Delony

LAKE PROVIDENCE

PLAQUEMINE

Portion LA-1A

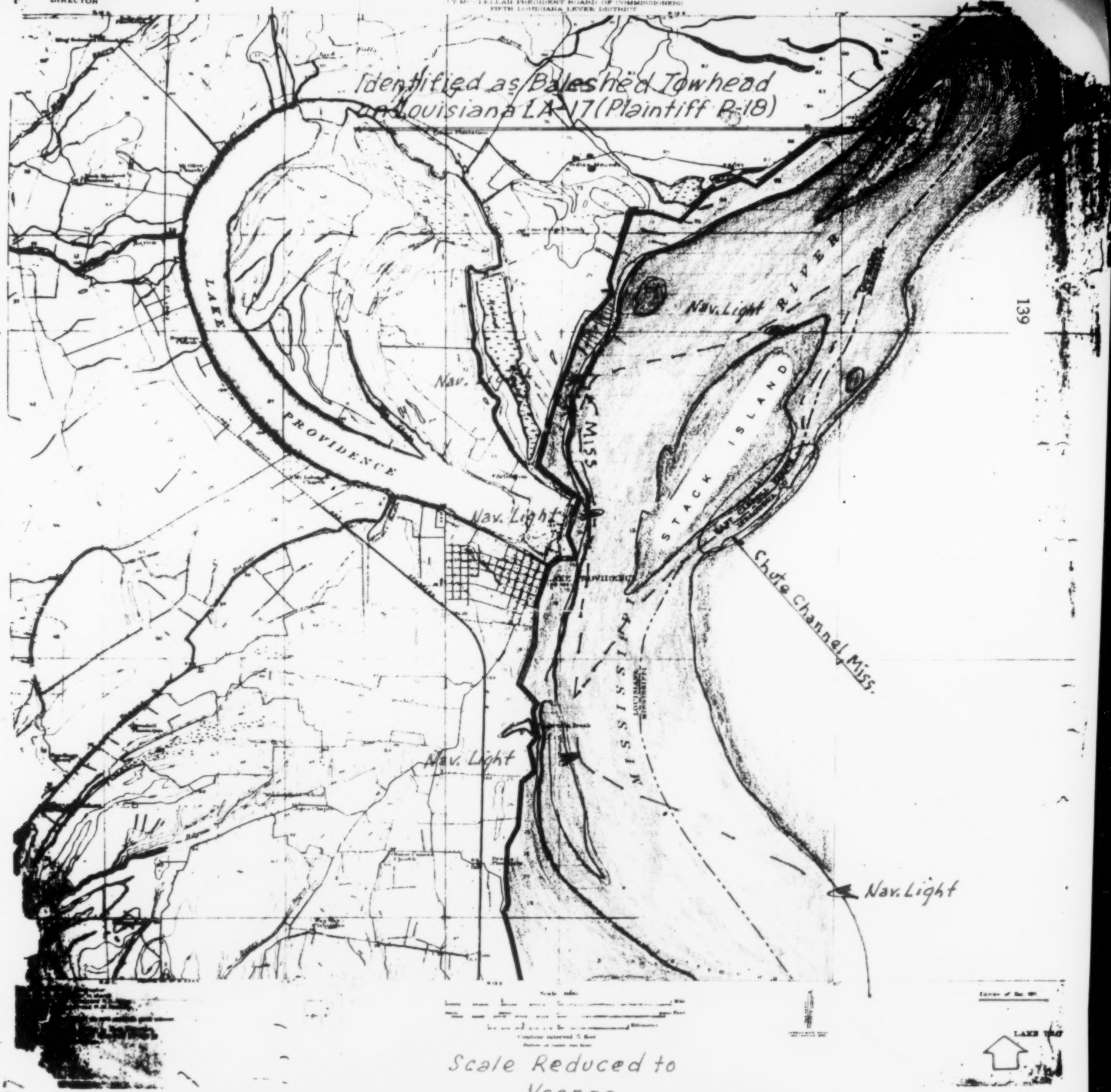
LAKE PROVIDENCE QUADRANGLE
LOUISIANA-MISSISSIPPI
7.5 MINUTE SERIES (TOPOGRAPHIC)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Plaintiff does not show the connection between Pt. No. 1 of claimed boundary and point of claimed avulsion 1911-1913

Point where the claimed old navigation channel containing the claimed fixed thalweg-boundary would be intercepted by the true navigation channel in the period 1911-1913 when Plaintiff claims an avulsion occurred "at Stack Island." (Pg. 2 of Judgment July 3, 1989. See P-18

All of Plaintiff's exhibits P-18 (1913), P-19 (1925), P-20 (1930) show that Plaintiff extends the claimed old channel containing the claimed fixed thalweg-boundary downstream on the true thalweg (Along the Hagaman Revetment Exhibit P-20, 1930 and along the later re-located Old River-Stack Island Revetment Exhibit P-[illegible]



LOUISIANA - MISSISSIPPI BOUNDARY 1911

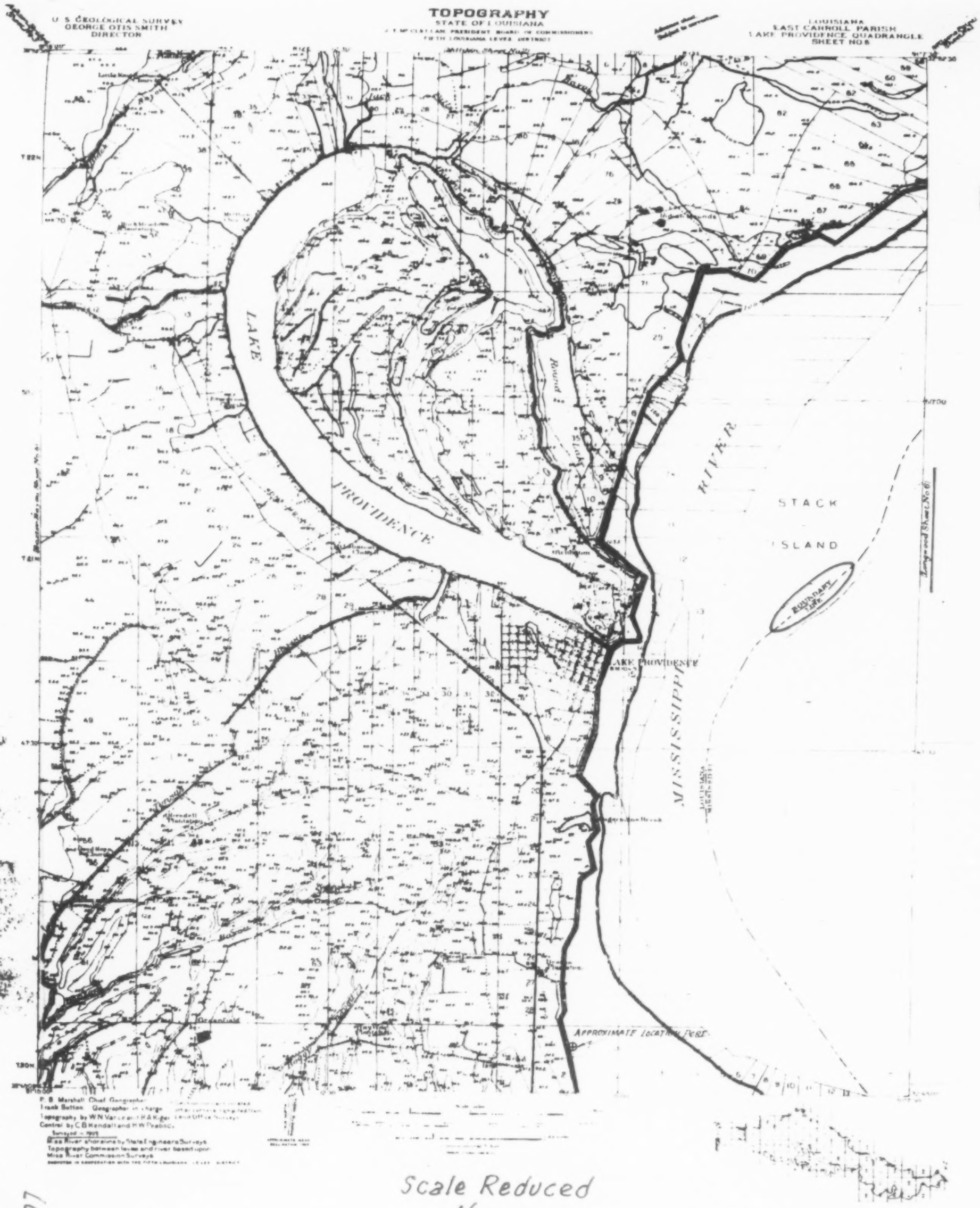
LA-16 showing river between banks and islands therein from Mississippi River Commission survey of November 1908 (Plaintiff Exhibit P-17).

Within the banks of the river the topography, including Stack Island, is identical to that shown on Plaintiff P-17 Shoreline Survey of Nov. 9908 by Mississippi River Commission

DESCRIPTIVE MATERIAL IN COLOR ADDED TO BASE MAP LA-16

LOUISIANA EXHIBIT LA-16
1911 EDITION

④



Scale Reduced
1/62500

Louisiana-Mississippi Boundary 1909

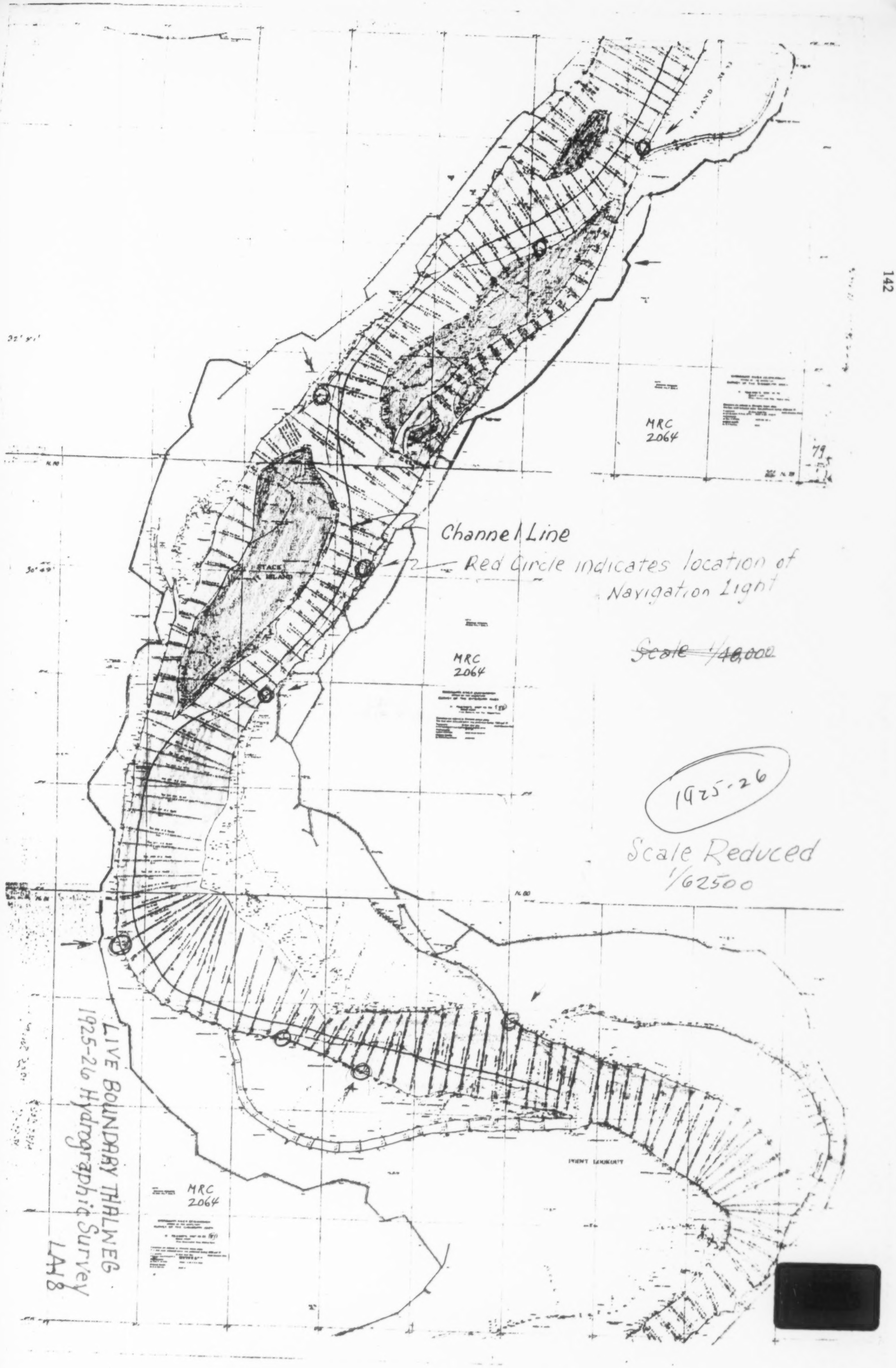
Within the banks of the river the topography, including Stack Island, is identical to that shown on Plaintiff P-17 Shoreline Survey of Nov. 1908 by Mississippi River Commission.

LOUISIANA EXHIBIT LA-16A
1909 EDITION
DESCRIPTIVE NOTES ADDED IN RED
TO BASE MAP LA-16A

(4A)

LA 76A

5



Channel Line

Red Circle indicates location of Navigation Light

~~Scale 1/40,000~~

1925-26

Scale Reduced 1/62500

LIVE BOUNDARY THALWEG
1925-26 Hydrographic Survey
LAB


Enlarged for Clarity
LEGEND
Pile Dikes driven before Dec 1st 1882
" " " Since " " "
Woven mat made and not sunk
" " " " Sunk
Bank revetment
Dike Wattled
Dike with foot mat sunk
" " " " not sunk
Represents water line at 6 ft on L.P. Gauge Dec 1881
" " " " " " Sep 1883
M. R. COMMISSION CONSTRUCTION WORKS
LAKE PROVIDENCE REACH
MAP
SHOWING THE CONDITION OF WORKS
OCTOBER 31st 1883
Under the direction of
CAPT W. L. MARSHALL
CORPS-OF-ENGINEERS U.S.A.
ARTHUR-HIDER-ASST-ENGR-IN-CHARGE
SCALE OF FEET
METERS
PLATE II
LOUISIANA
MISSISSIPPI
NAVIGATION 1881
TRACK OF
COTTONWOOD CHUTE
VISTA LDG
LONGWOOD LDG
ELTON
WILDERNESS LDG
OLD BALESHED CHUTE
MAP
SHOWING MAT WORK WASHED OUT
1883
MAYERSVILLE BD
Showing Navigation Channel
December, 1881
Portion LA-18A
Water Line at 6' on Lake Providence Gage
December, 1881
Areas in River Bed above 6' on Lk. Prov. Gage

PLATE. II.

7

M. R. COMMISSION. CONSTRUCTION WORKS

LAKE PROVIDENCE REACH

MAP

SHOWING THE CONDITION OF WORKS

OCTOBER 31st 1883

Under the direction of

CAPT W. L. MARSHALL

CORPS OF ENGINEERS U.S.A

ARTHUR HIDER ASST ENGR IN CHARGE

SCALE OF FEET

METERS

Enlarged for Clarity

LEGEND

- Pile Dikes driven before Dec 1st 1882
- " " " Single " " "
- Woven mat made and not sunk
- " " " " Sunk
- Bank revetment
- Dike Wattled
- Dike with fascine sunk
- " " " " not sunk
- Represents water line at 6ft on Lk Gauge Dec 1883
- " " " " " " Sept 1883

PLATE II

Navigation Channel

Sept. 1883

VISTA LDG

LONGWOOD LDG

ELTON

BALESHED CHUTE

BALESHED BAR

MAIN DIKE

STACK ISD

STACK ISD CHUTE

COTTONWOOD CHUTE

WILDERNESS LDG

MAYERSVILLE ISD

LOUISIANA

MISSISSIPPI

LEGEND

Water Line at 6' on Lake Providence Gage

September, 1883

Areas in River Bed above 6' on Lk. Prov. Gage

MAP

SHOWING MAT WORK WASHED OUT

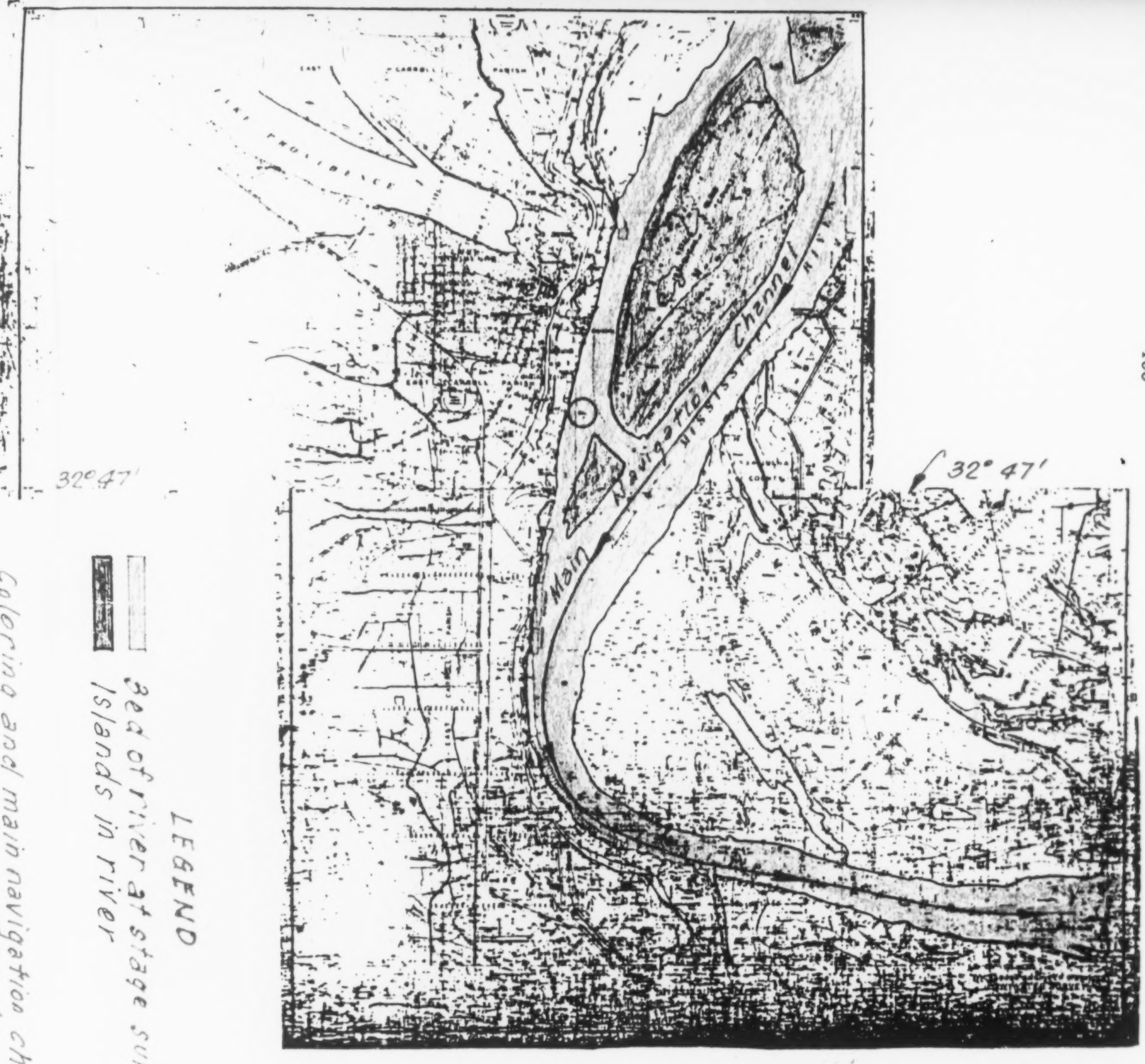
1883

MAYERSVILLE ISD

Portion LA-18A

Showing Navigation Channel

September, 1883



CONFLUENCE BAR ACCRETION

The land mass or island immediately south of Stack Island, claimed by Plaintiff to be "confluence bar accretion" (Paragraph 3 of Judgment of July 3, 1989) was formed in the State of Louisiana west of the boundary thalweg. This land mass formed independent of Stack Island and was separated from it by the main ferry channel. Later, this separate island attached to Stack Island and cannot be considered accretion to Stack Island.

PLATE XV

COURSES OF THE MEANDER BELT NEAR THE LAKE PROVIDENCE REACH

La 32H